Energy Efficiency:
The first and most profitable way to delay Climate Change
Law Seminars International
ENERGY IN CALIFORNIA
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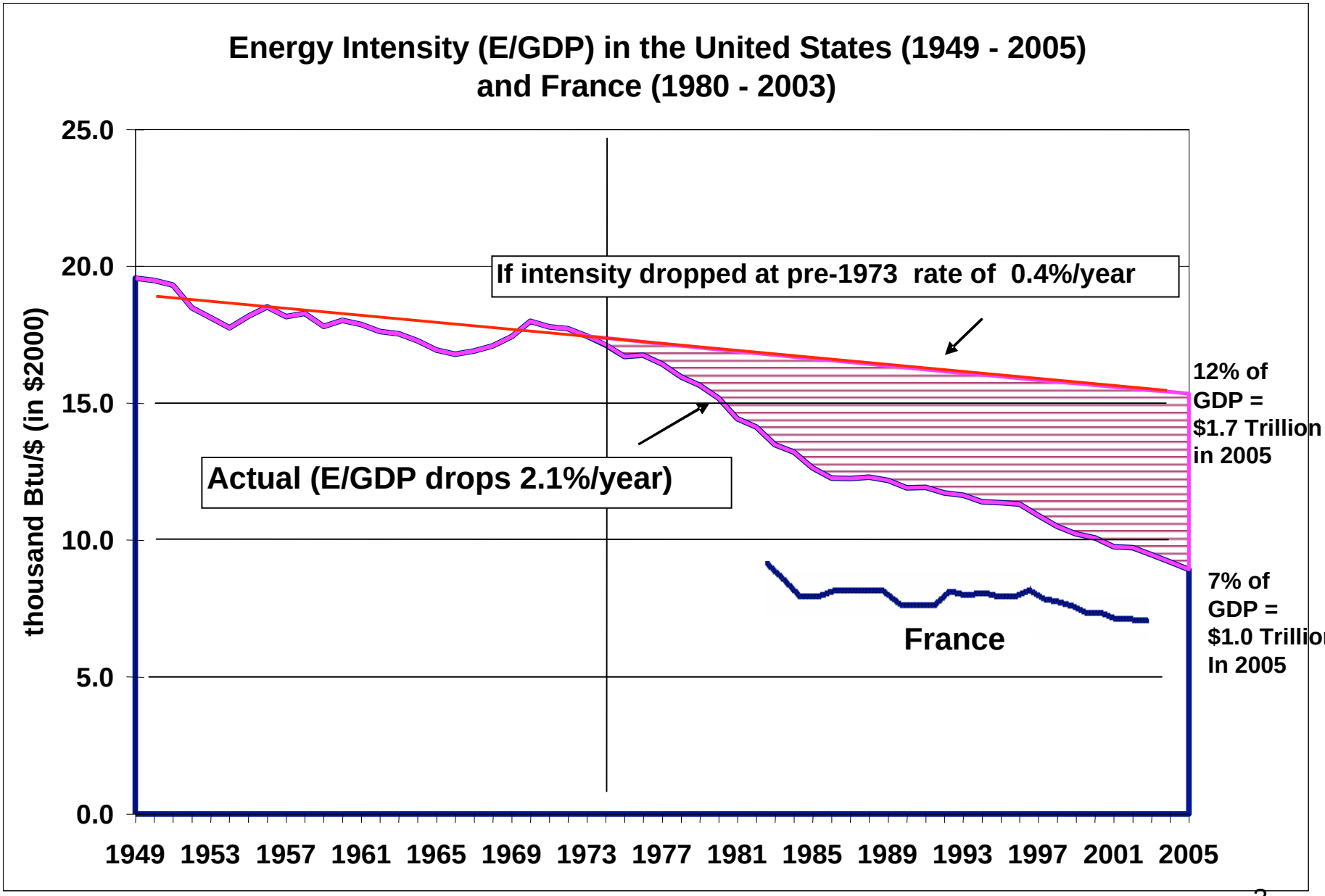
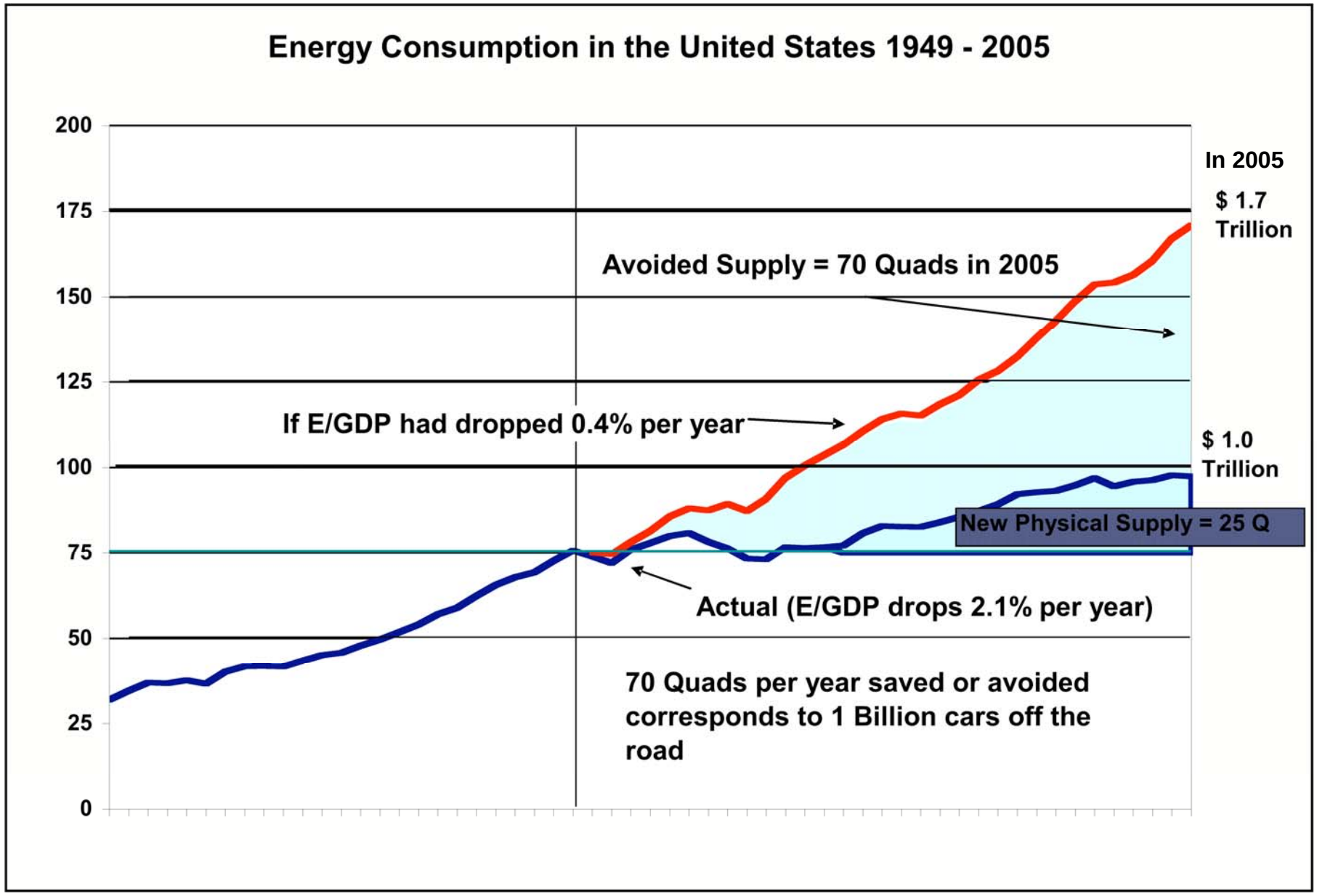
California Energy Commission Responsibilities

Both Regulation and R&D

- California Building and Appliance Standards
  - Started 1977
  - Updated every few years
- Siting Thermal Power Plants Larger than 50 MW
- Forecasting Supply and Demand (electricity and fuels)
- Research and Development
  - ~ $80 million per year
- CPUC & CEC are collaborating to introduce communicating electric meters and thermostats that are programmable to respond to time-dependent electric tariffs.


Energy Intensity (E/GDP) in the United States (1949 - 2005)
and France (1980 - 2003)
thousand Btu/$ (in $2000)
25.0
20.0
15.0
10.0
5.0
0.0
1949
1953
1957
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
If intensity dropped at pre-1973 rate of 0.4%/year
Actual (E/GDP drops 2.1%/year)
France
12% of GDP = $1.7 Trillion in 2005
7% of GDP = $1.0 Trillion In 2005


Energy Consumption in the United States 1949 - 2005
200
175
150
125
100
75
50
25
0
In 2005
$ 1.7 Trillion
Avoided Supply = 70 Quads in 2005
If E/GDP had dropped 0.4% per year
$ 1.0 Trillion
New Physical Supply = 25 Q
Actual (E/GDP drops 2.1% per year)
70 Quads per year saved or avoided corresponds to 1 Billion cars off the road

How Much of The Savings Come from Efficiency

- Some examples of estimated savings in 2006 based on 1974 efficiencies minus 2006 efficiencies

	Billion $
Space Heating	**40**
Air Conditioning	**30**
Refrigerators	**15**
Fluorescent Tube Lamps	**5**
Compact Floursecent Lamps	**5**
Total	**95**

- Beginning in 2007 in California, reduction of “vampire” or stand-by losses
  - This will save $10 Billion when finally implemented, nation-wide
- Out of a total **$700 Billion**, a crude summary is that 1/3 is structural, 1/3 is from transportation, and 1/3 from buildings and industry.

Two Energy Agencies in California

- The California Public Utilities Commission (CPUC) was formed in 1890 to regulate natural monopolies, like railroads, and later electric and gas utilities.
- The California Energy Commission (CEC) was formed in 1974 to regulate the environmental side of energy production and use.
- Now the two agencies work very closely, particularly to delay climate change.
- The Investor-Owned Utilities, under the guidance of the CPUC, spend “Public Goods Charge” money (rate-payer money) to do everything they can that is cost effective to beat existing standards.
- The Publicly-Owned utilities (20% of the power), under loose supervision by the CEC, do the same.

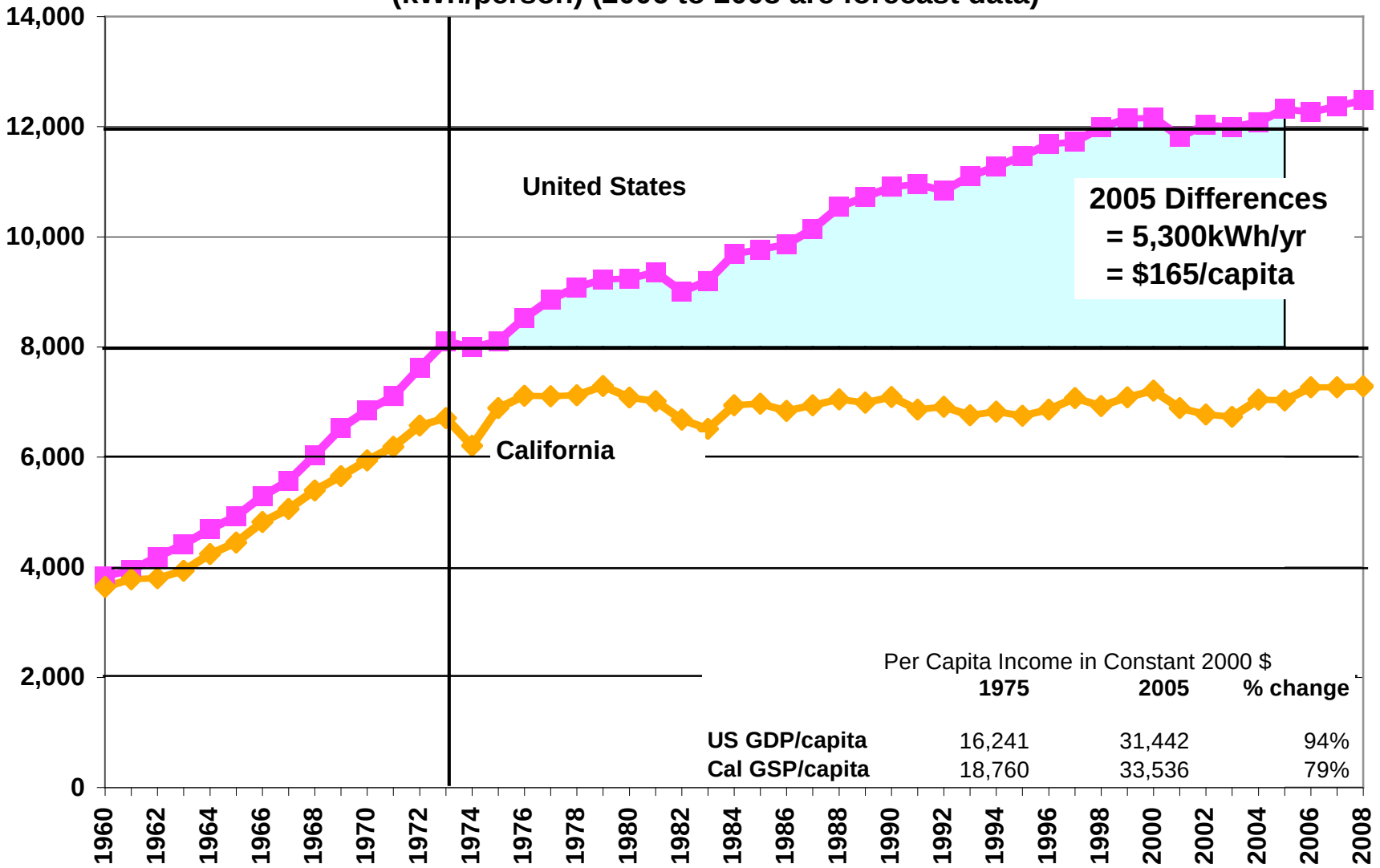
California's Energy Action Plan

- California's Energy Agencies first adopted an Energy Action Plan in 2003. Central to this is the State's preferred "Loading Order" for resource expansion.

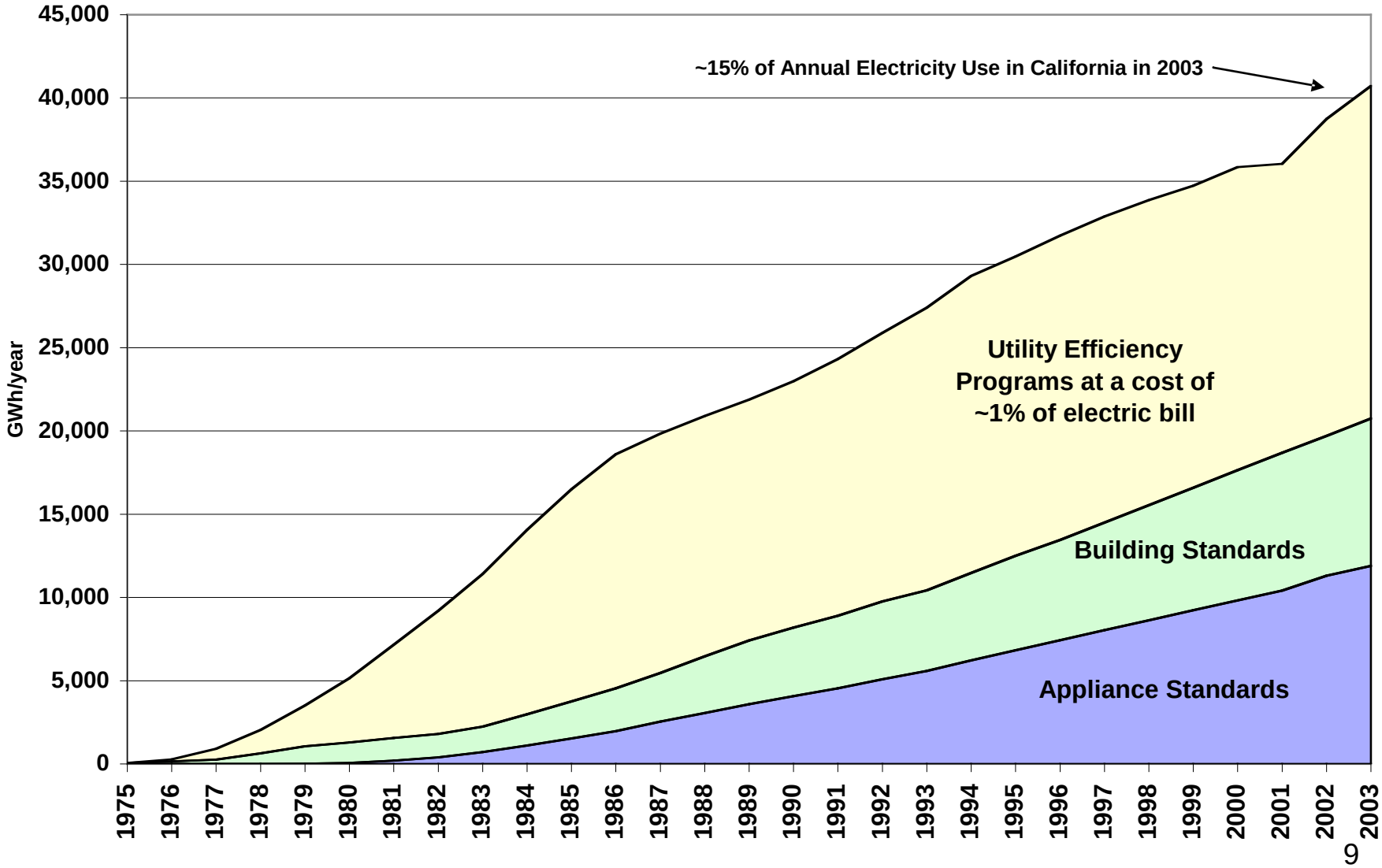
- 1. Energy efficiency and Demand Response
- 2. Renewable Generation,
- 3. Increased development of affordable & reliable conventional generation
- 4. Transmission expansion to support all of California's energy goals.

- The Energy Action Plan has been updated since 2003 and provides overall policy direction to the various state agencies involved with the energy sectors

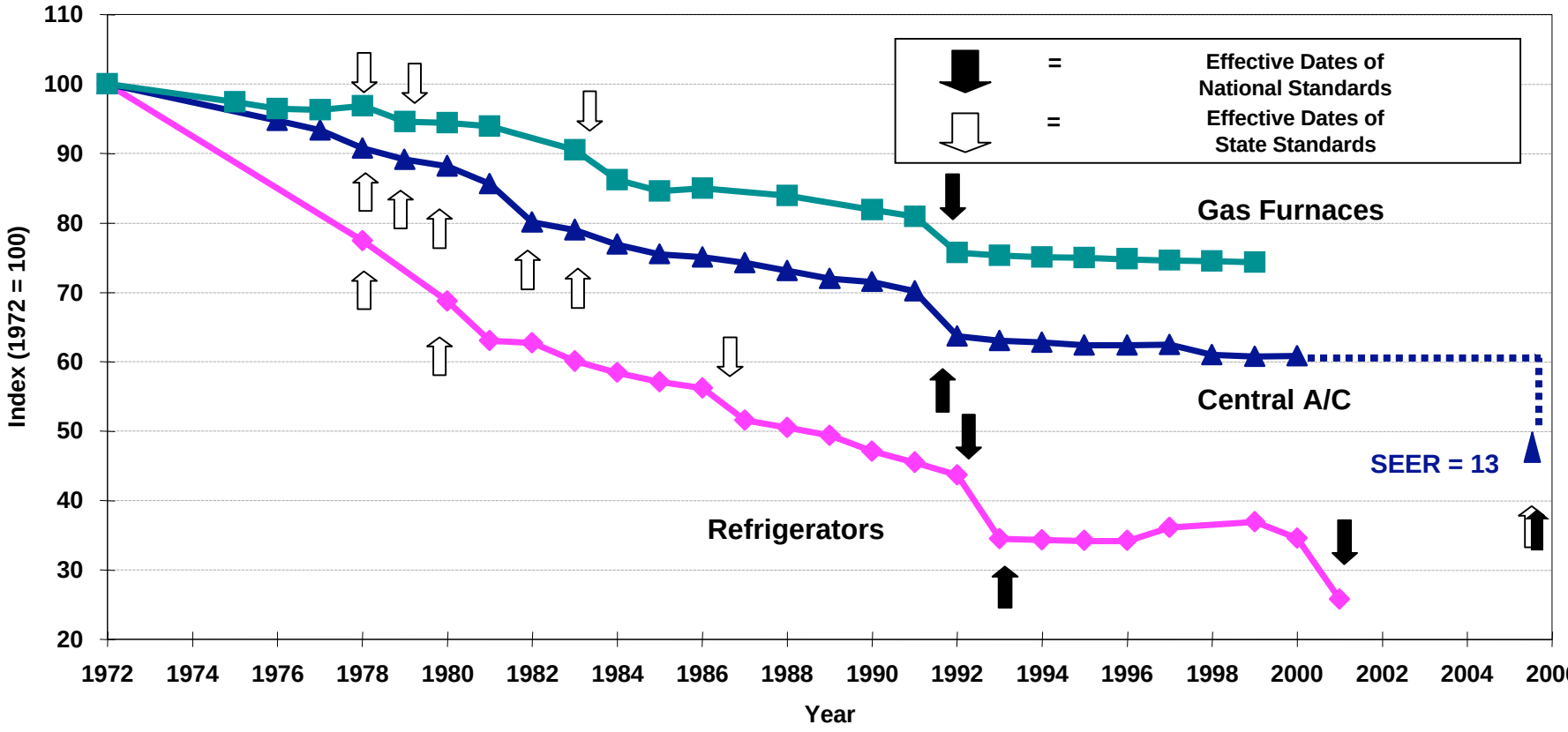
Per Capita Electricity Sales (not including self-generation) (kWh/person) (2006 to 2008 are forecast data)



Annual Energy Savings from Efficiency Programs and Standards

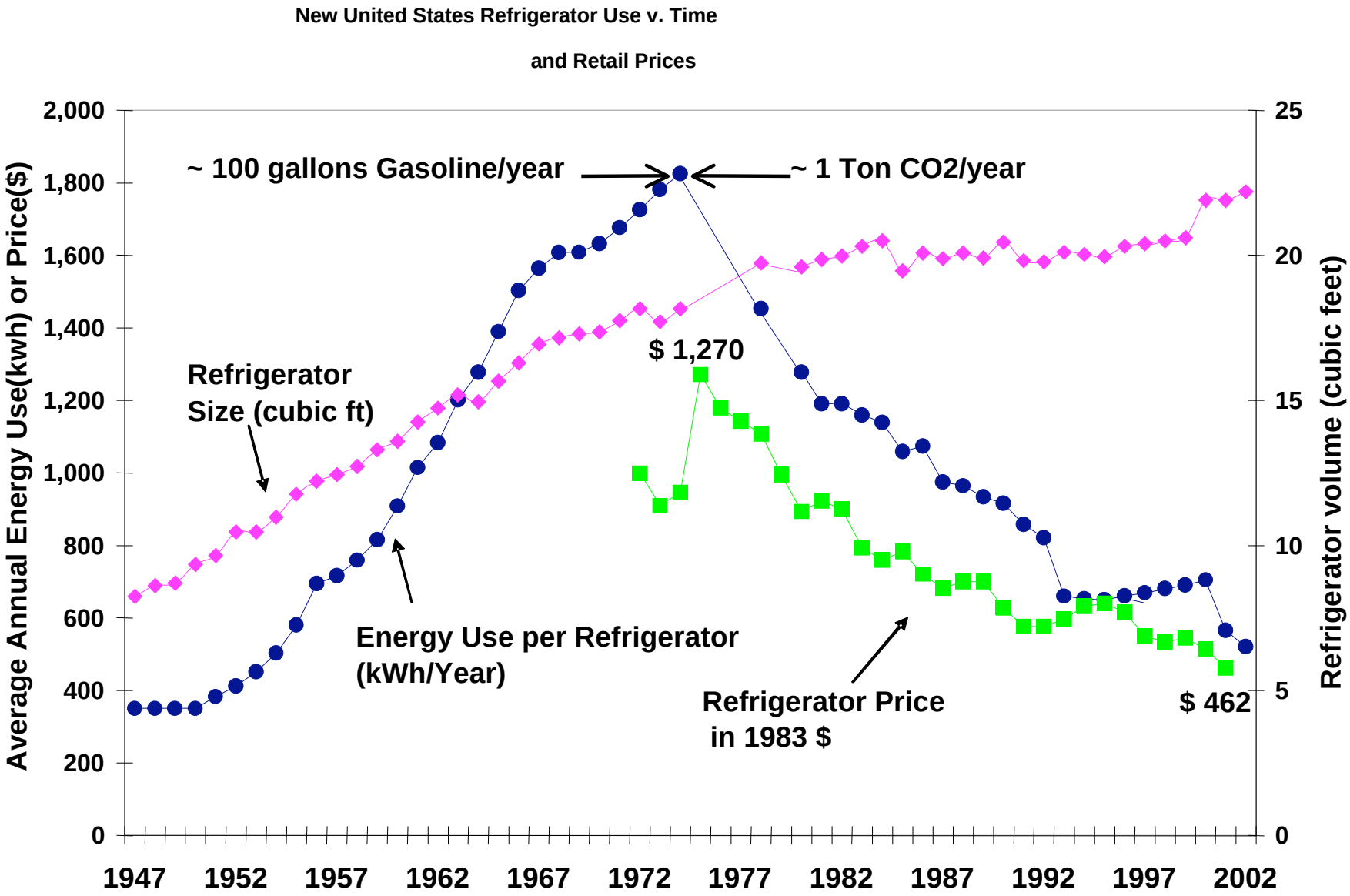


Impact of Standards on Efficiency of 3 Appliances



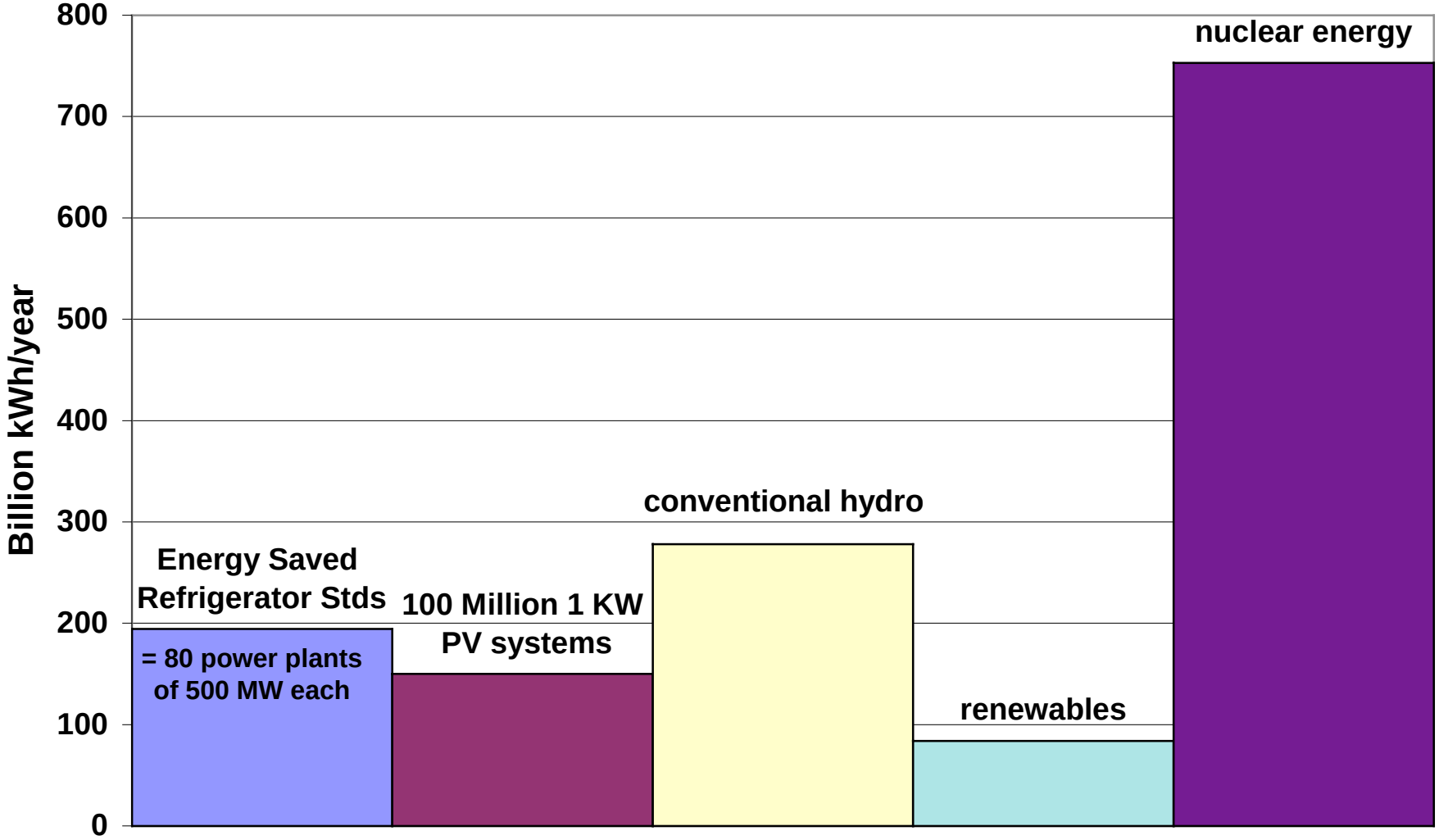
Source: S. Nadel, ACEEE,

in ECEEE 2003 Summer Study, www.eceee.org



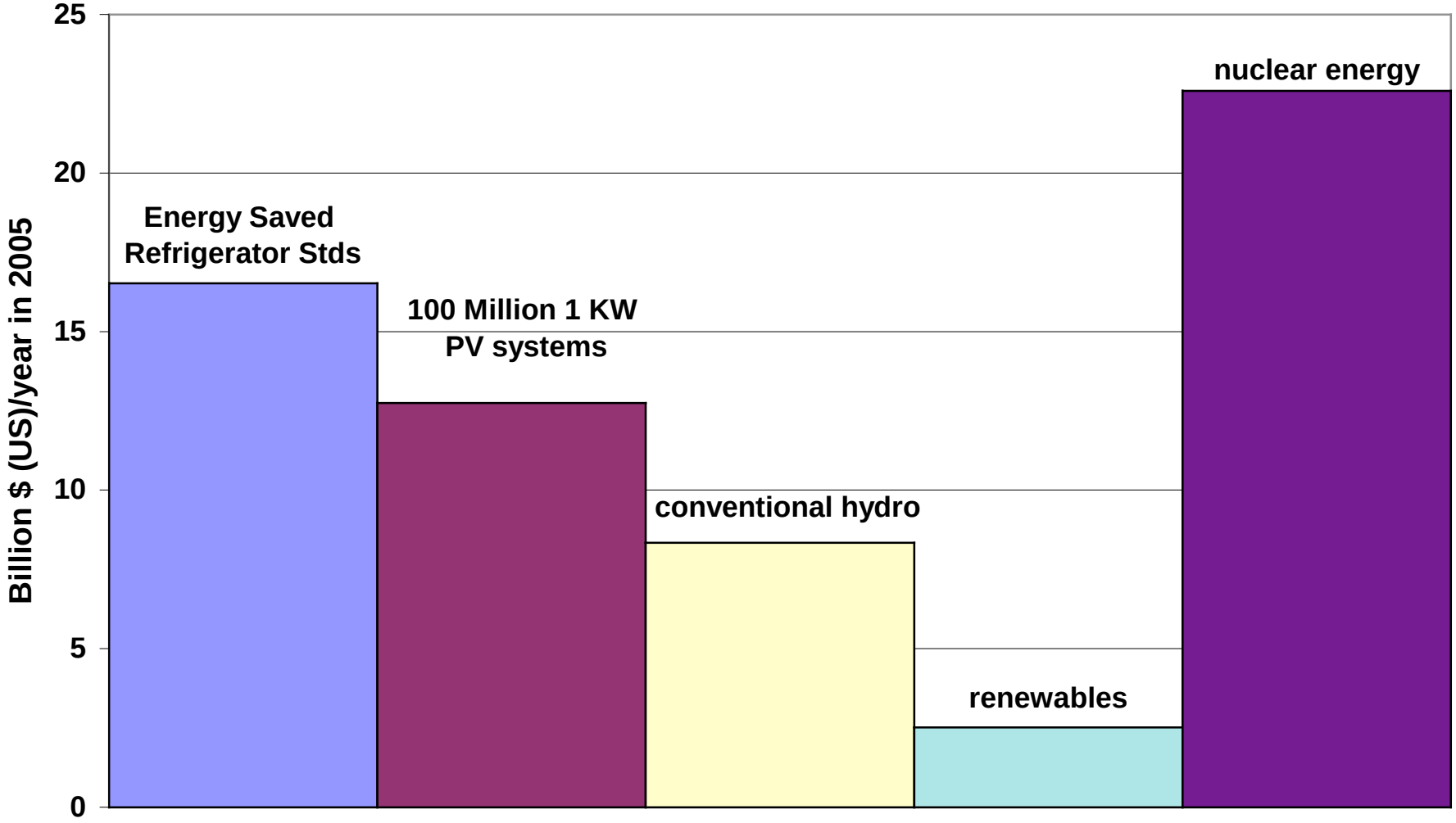
Source: David Goldstein

Annual Energy Saved vs. Several Sources of Supply In the United States

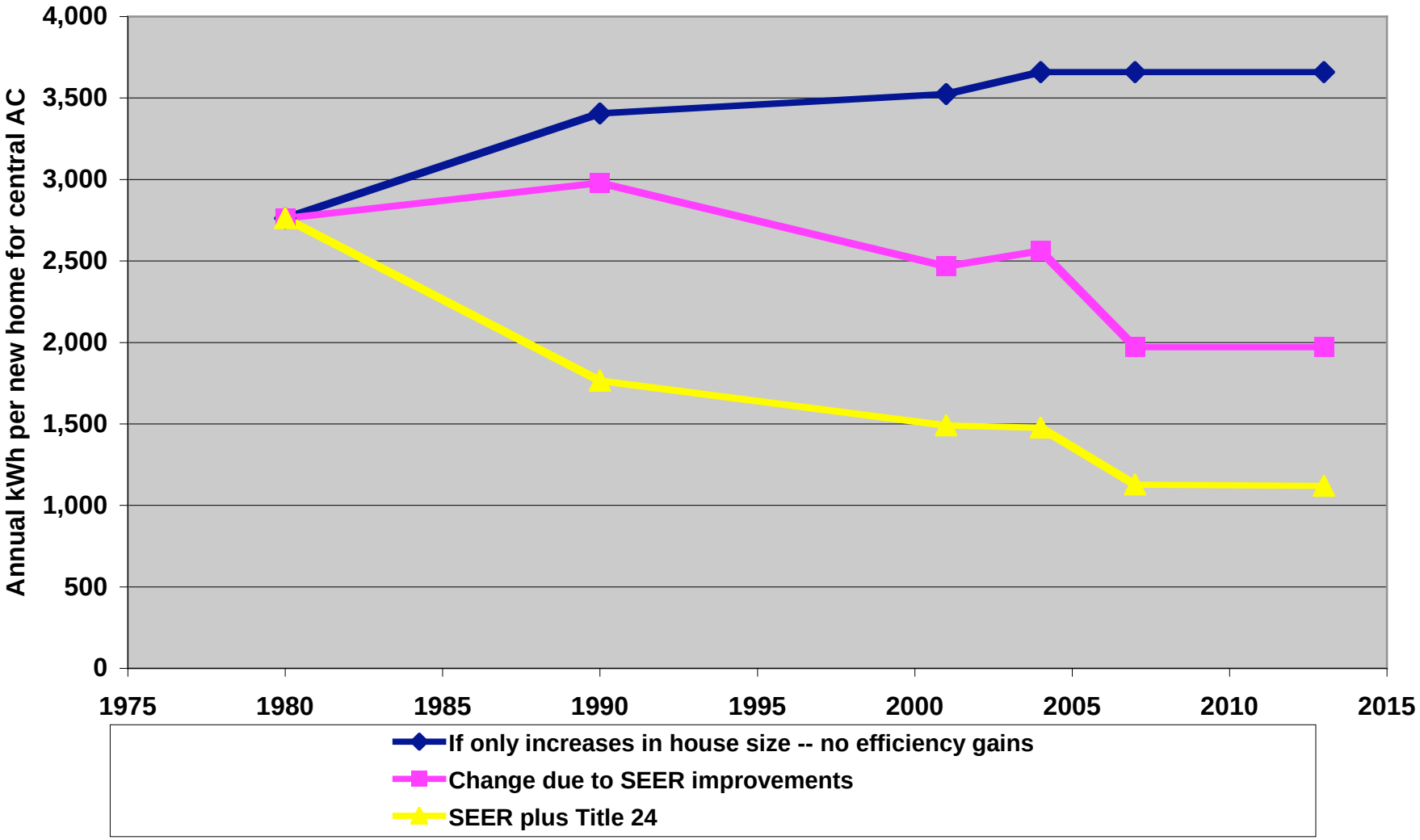


In the United States

Value of Energy to be Saved (at 8.5 cents/kWh, retail price) vs. Several Sources of Supply in 2005 (at 3 cents/kWh, wholesale price)

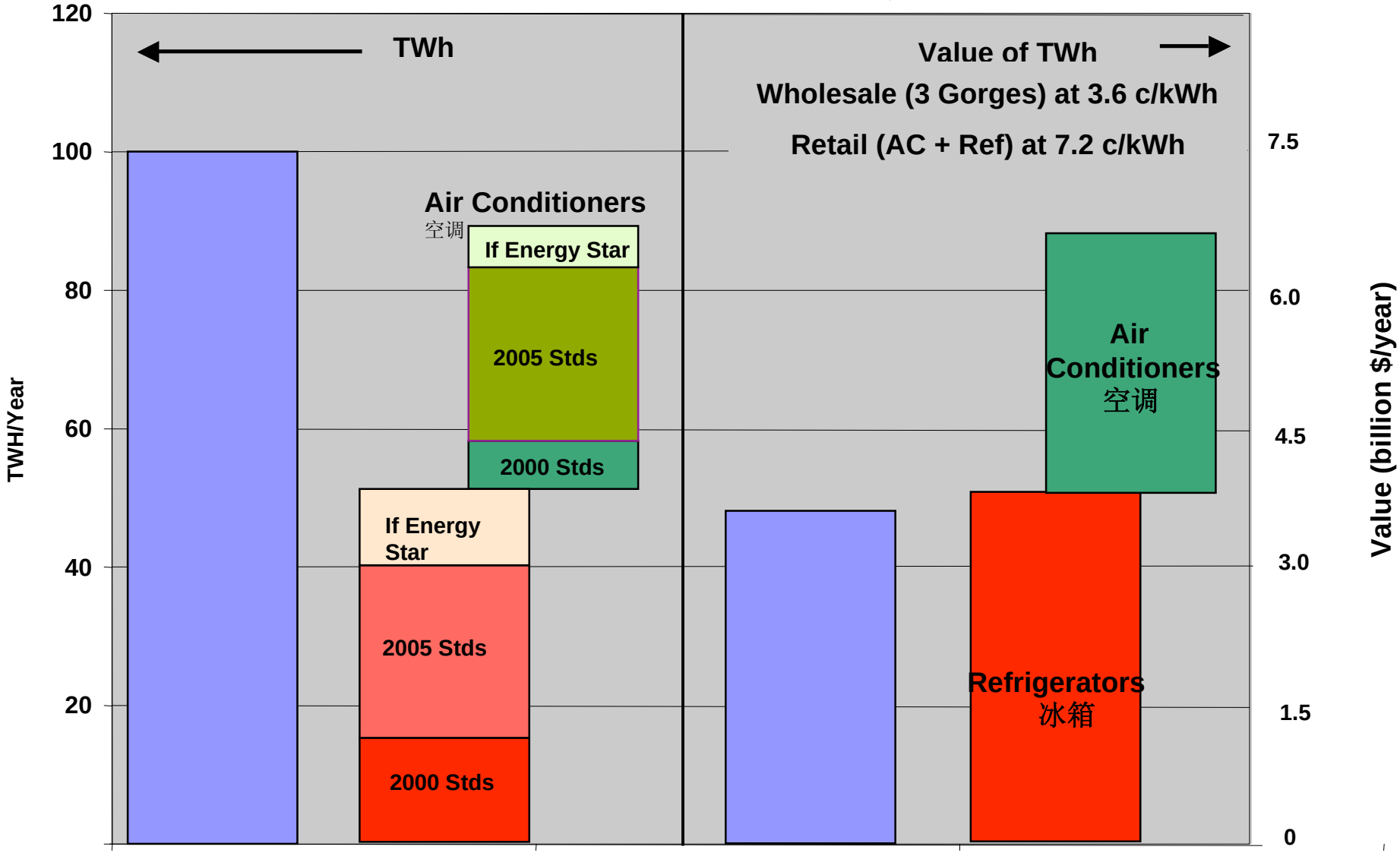


Air Conditioning Energy Use in Single Family Homes in PG&E
The effect of AC Standards (SEER) and Title 24 standards



Comparison of 3 Gorges to Refrigerator and AC Efficiency Improvements

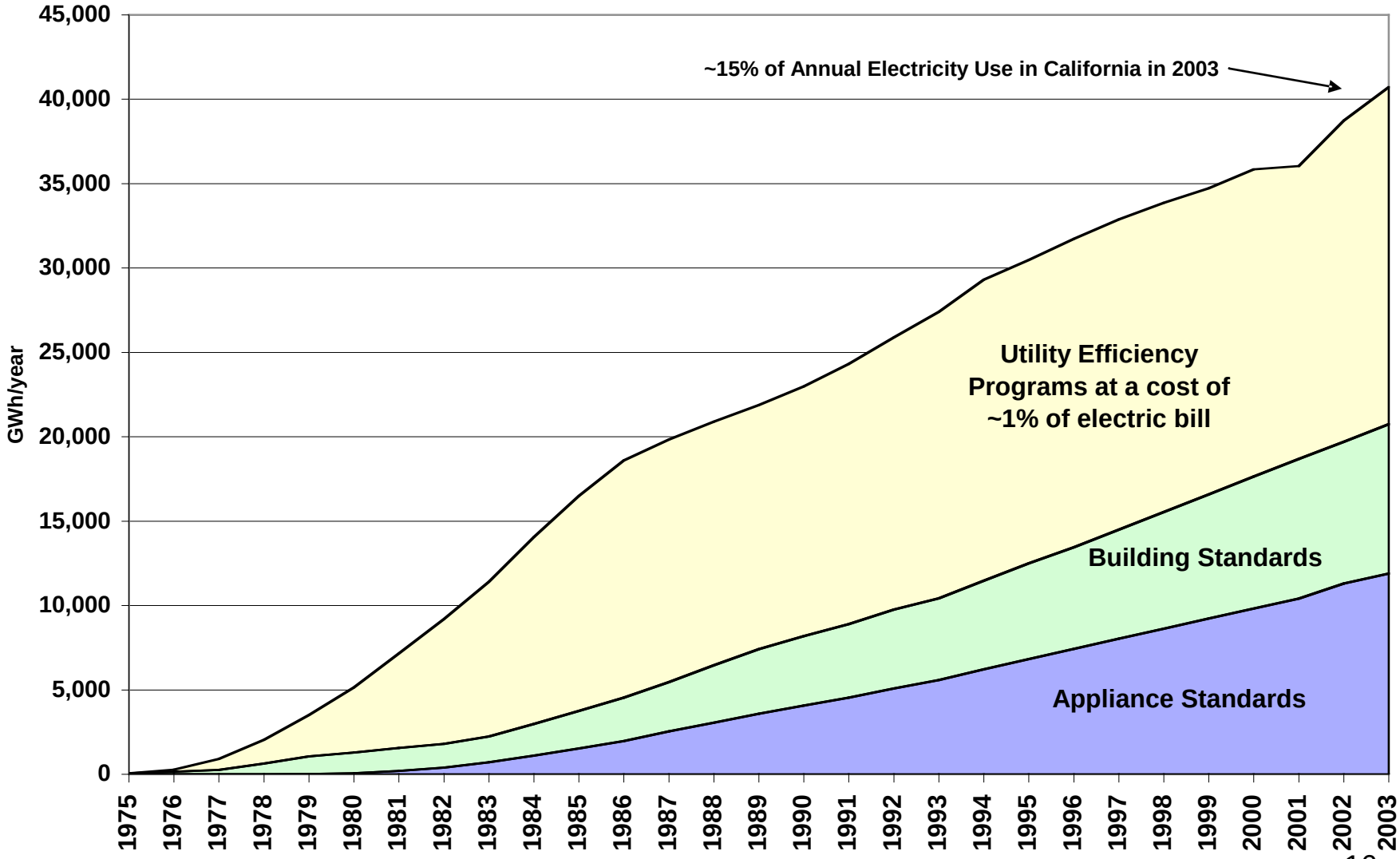
三峡电量与电冰箱、空调能效对比



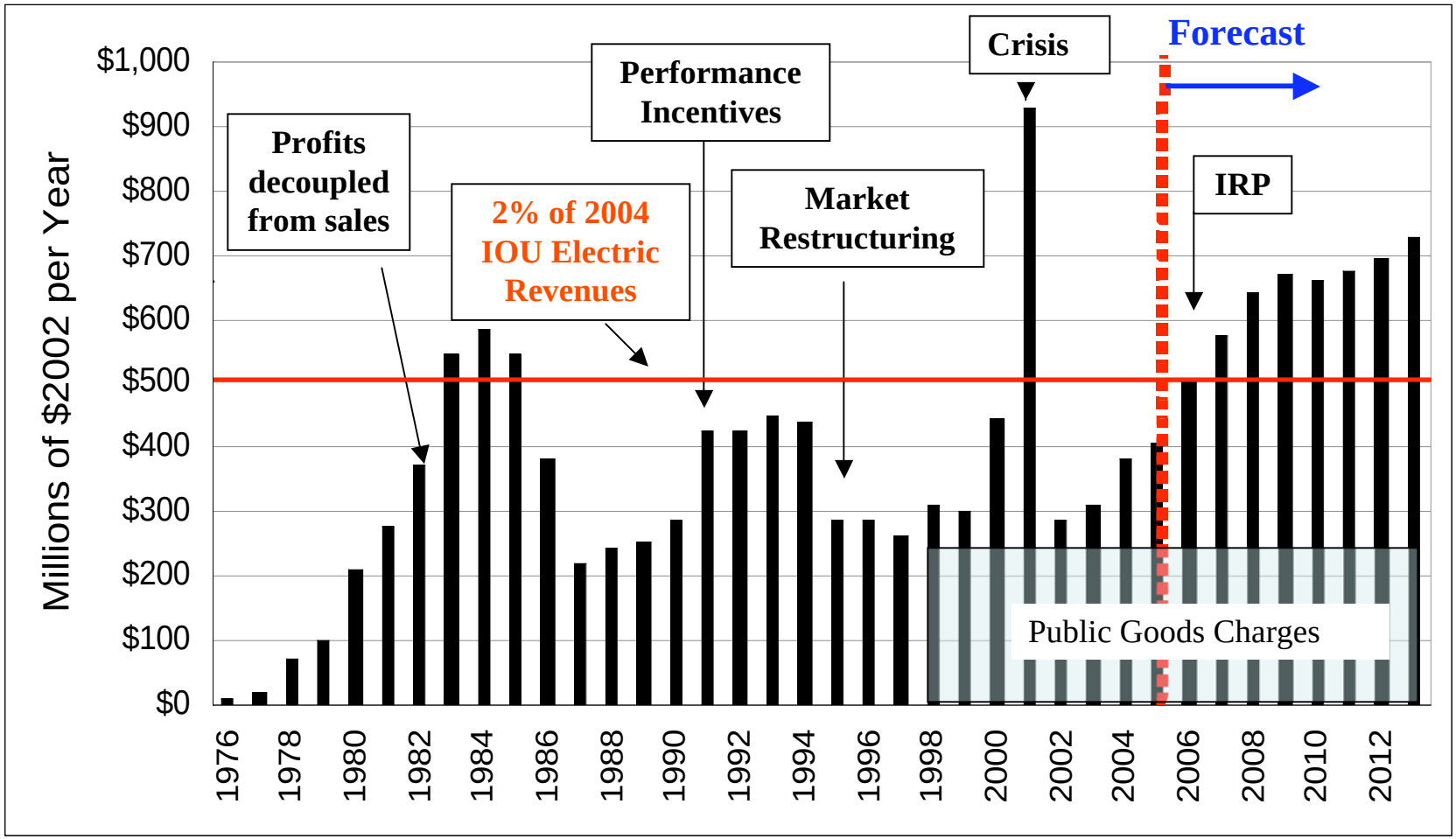
Savings calculated 10 years after standard takes effect. Calculations provided by David Fridley, LBNL

标准生效后，10年节约电量

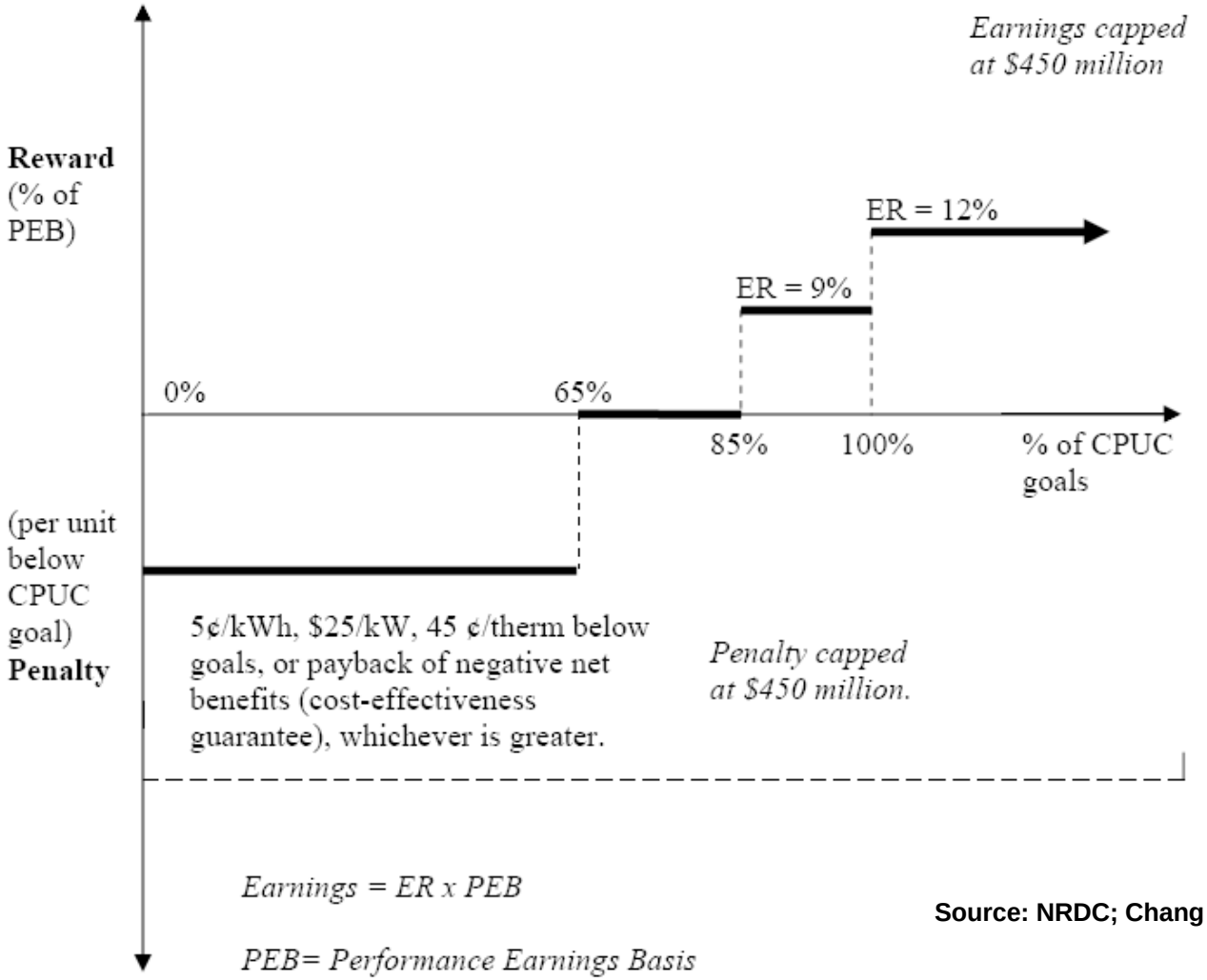
Annual Energy Savings from Efficiency Programs and Standards



California IOU's Investment in Energy Efficiency

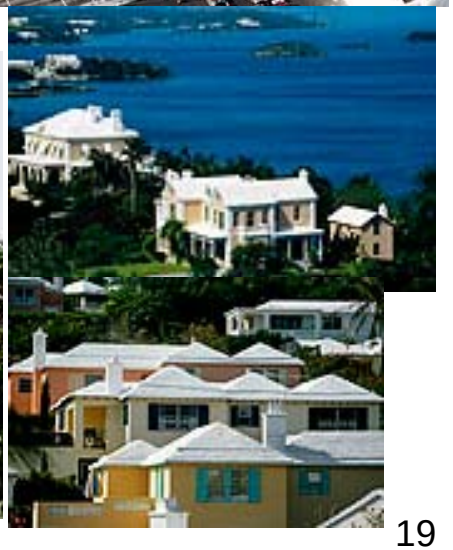


Energy Efficiency Incentive Mechanism Earnings/Penalty Curve
(D.07-09-043, p. 8)



Source: NRDC; Chang and Wang, 9/26/2007

1000 ft^2 of a white roof, replacing a dark roof, offset the emission of 10 tonnes of CO_2



CO_2 Equivalency of Cool Roofs and Pavements

- 44 GT CO_2 is over one year of the world 2025 emission of 37 GT CO_2
- At a growth rate of 1.5% in the world's CO_2 -equivalent emission rate, 44 GT CO_2 would offset the effect of the growth in CO_2-equivalent emissions for 11 years

Equivalent Value of Avoided CO_2

- CO_2 emissions currently trade at ~$25/tonne
- 44 GT worth $1100, for changing albedo of roofs and paved surface
- Cooler roofs alone worth $600B
- Cooler roofs also save air conditioning (and provide comfort) worth several times $600B

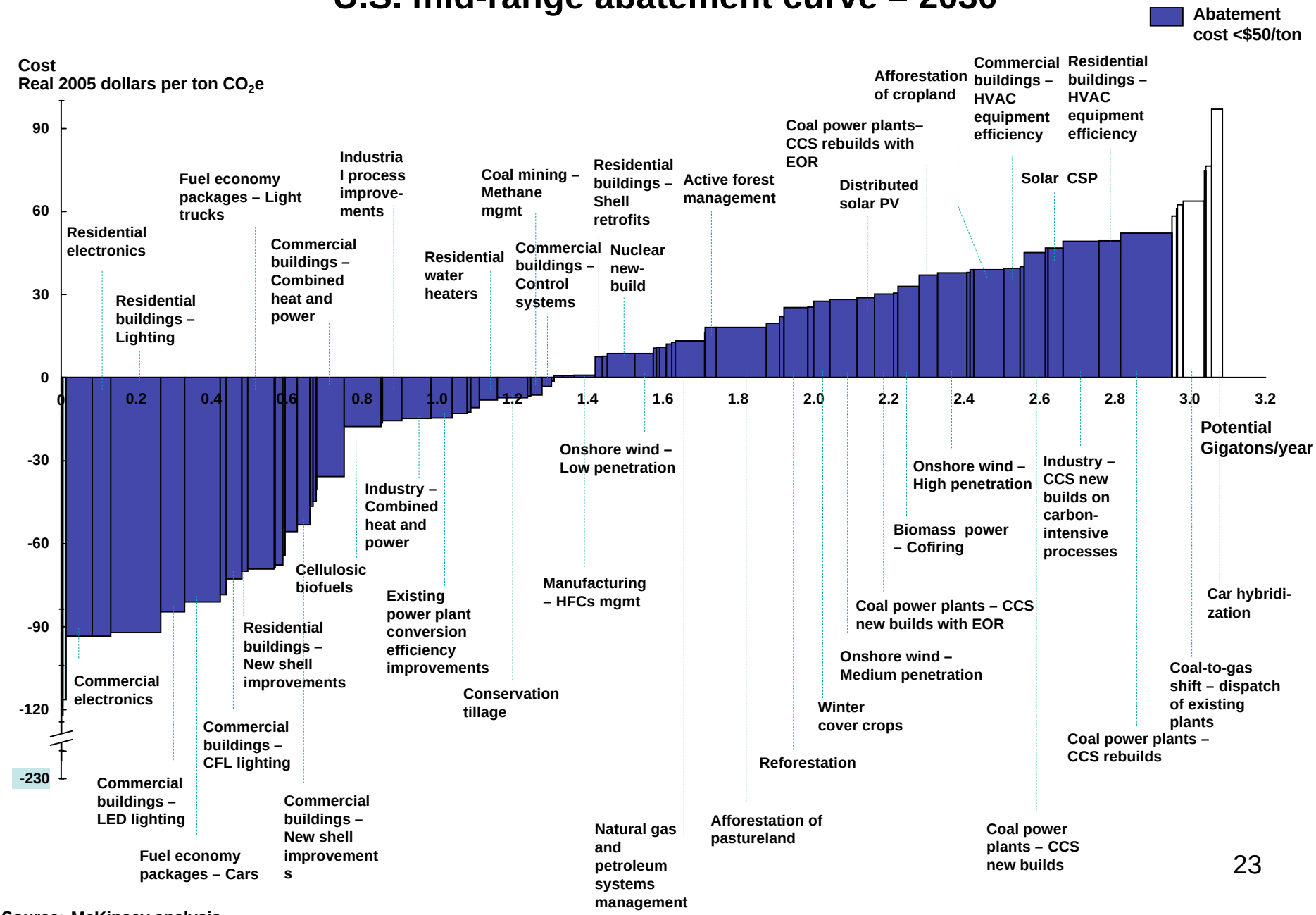
Reducing U.S. Greenhouse Gas Emissions: *How Much at What Cost?*

US Greenhouse Gas Abatement Mapping Initiative

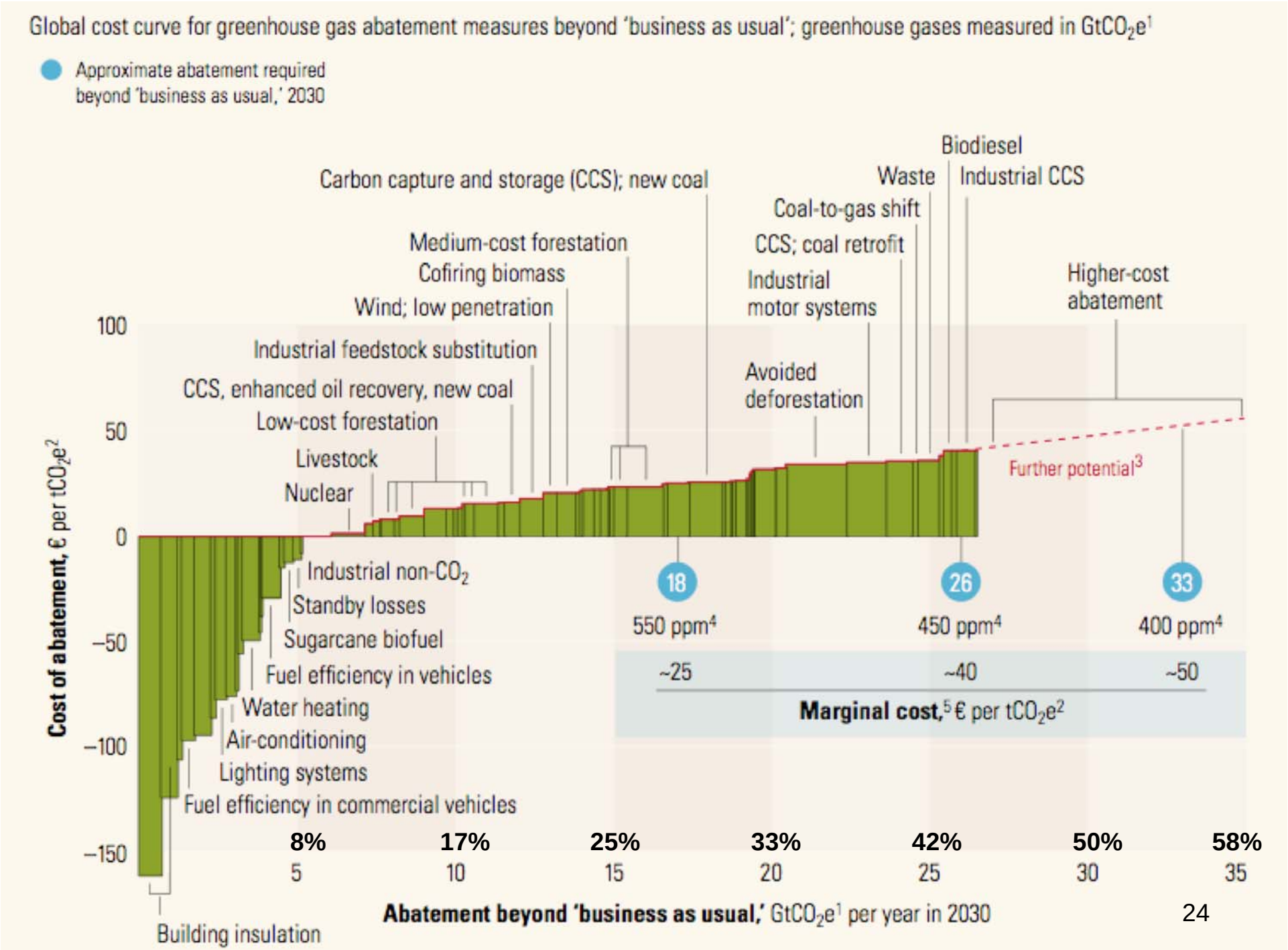
December 12, 2007

McKinsey&Company

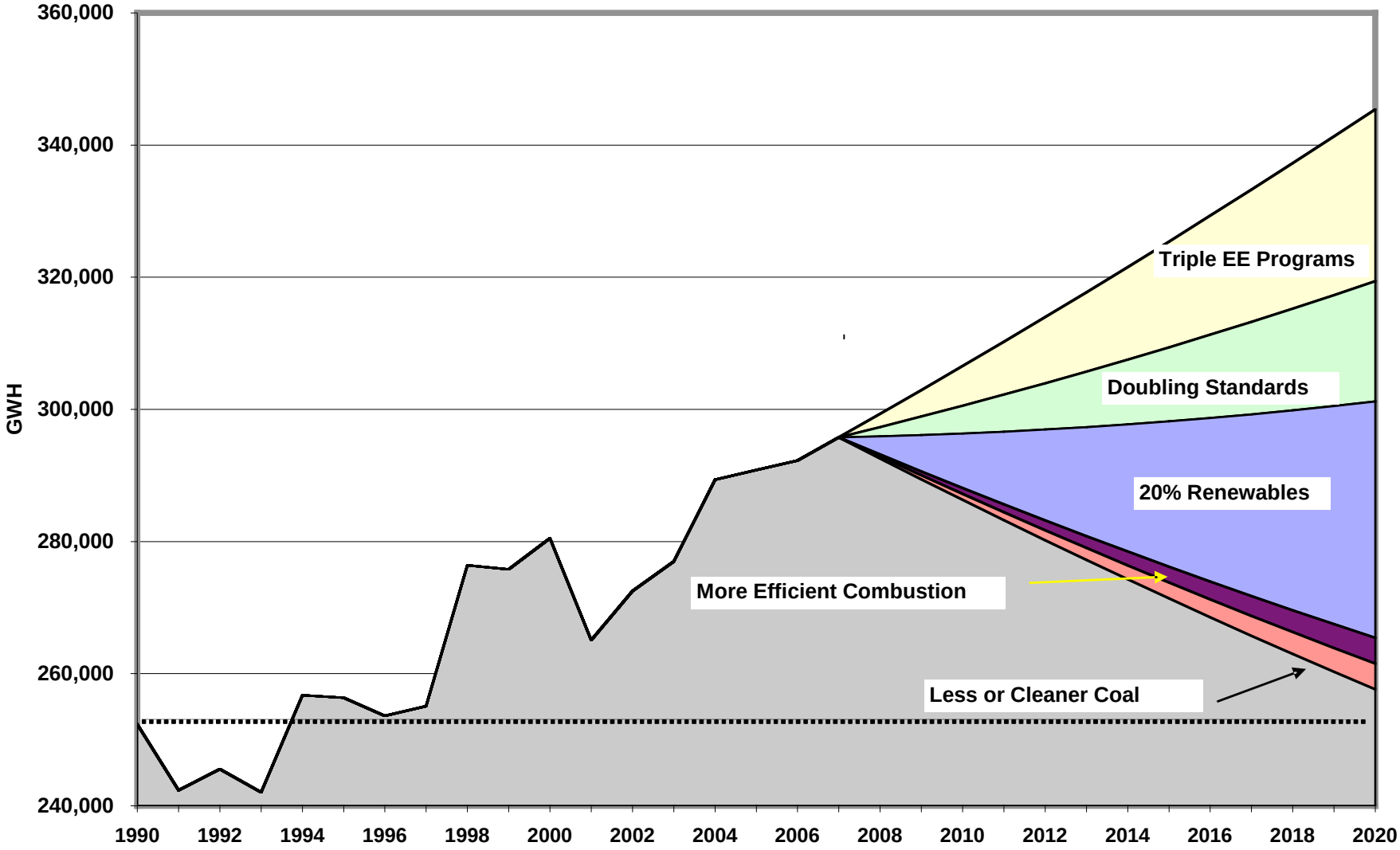
U.S. mid-range abatement curve – 2030



Source: McKinsey analysis

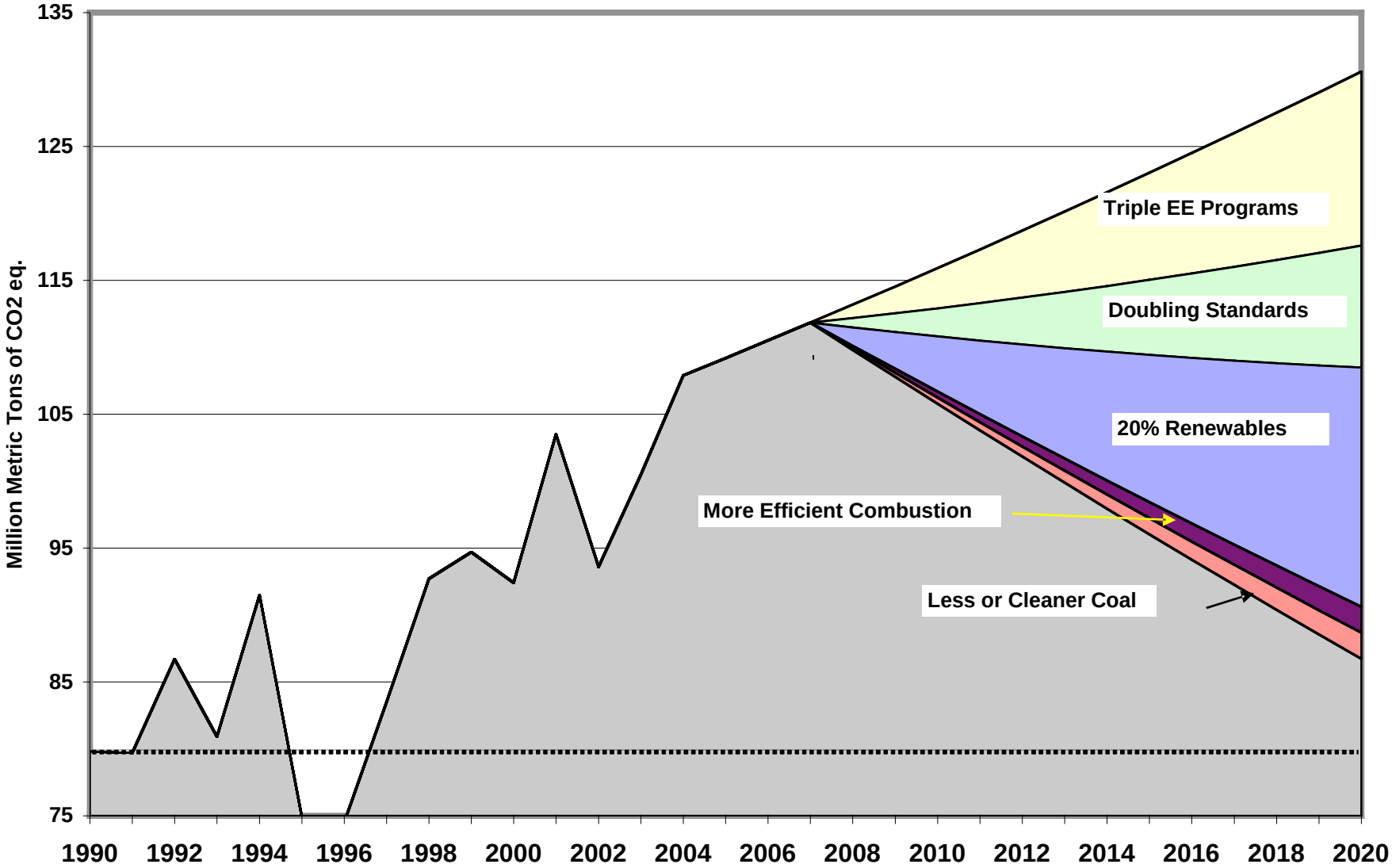

Global cost curve for greenhouse gas abatement measures beyond 'business as usual'; greenhouse gases measured in $GtCO_2e^1$
Approximate abatement required beyond 'business as usual,' 2030
Biodiesel
Waste
Industrial CCS
Carbon capture and storage (CCS); new coal
Coal-to-gas shift
Medium-cost forestation
CCS; coal retrofit
Cofiring biomass
Industrial motor systems
Higher-cost abatement
Wind; low penetration
Industrial feedstock substitution
Avoided deforestation
CCS, enhanced oil recovery, new coal
Low-cost forestation
Livestock
Nuclear
Further potential3
100
50
0
−50
−100
−150
Cost of abatement, € per tCO_2e^2
Industrial non-CO_2
Standby losses
Sugarcane biofuel
Fuel efficiency in vehicles
Water heating
Air-conditioning
Lighting systems
Fuel efficiency in commercial vehicles
Building insulation
18
26
33
550 ppm4
450 ppm4
400 ppm4
~25
~40
~50
Marginal cost,5 € per tCO_2e^2
8%
17%
25%
33%
42%
50%
58%
5
10
15
20
25
30
35
Abatement beyond 'business as usual,' $GtCO_2e^1$ per year in 2030

Possible Strategies to Reduce Electricity Sector Carbon Emissions in California, ignoring ramp up times and other implementation issues -- The ELECTRICITY Perspective



Source: Pat McAuliffe, pmcaulif@energy.state.ca.us

Possible Strategies to Reduce Electricity Sector Carbon Emissions in California, ignoring ramp up times and other implementation issues -- The CARBON Perspective



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The End

For More Information:

http://www.energy.ca.gov/commission/commissioners/rosenfeld.html

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